ARCHIV

The Forty-Sixth Annual Report

OF THE

UNIVERSITY OF MARYLAND

Agricultural Experiment Station

College Park, Prince George County, Maryland

1932-1933

PUBLISHED BY THE STATION

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The University of Maryland Agricultural Experiment Station

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AGRONOMY (CROPS AND SOILS).

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W. B. Kemp, Ph. D., Asso. Agron. (Genetics).
G. Eppley, M.S., Assistant (Crops).
O. C. Bruce, M.S., Asso. Soil Technologist.
R. P. Thomas, Ph.D., Soil Technologist.
E. H. Schmidt, M.S., Assistant (Soils).
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R. L. Sellman, B.S., Assistant.

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B. E. Carmichael, M.S., Animal Husbandman.
W. E. Hunt, M.S., Associate, Animal Husbandry.
L. W. Ingham, M.S., Associate (Dairy Production).
M. H. Berry, M.S., Assistant Dairy Husbandry.
H. L. Ayres, Dairy Mfg.
W. C. Supplee, Ph.D., Assistant (Meat Curing).

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R. C. Reed, Ph.B., D.V.M., Pathologist.
** A. L. Brueckner, B.S., D.V.M., Associate Pathologist.
L. J. Poelma, D.V.M., M.S., Assistant.
H. M. Devolt, D.V.M., Assistant (Poultry Diseases).
C. L. Everson, D.V.M., Assistant.
** Alex. Gow, D.V.M., Assistant.
** C. R. Davis, M.S., D.V.M., Assistant (Poultry Diseases).
M. T. Bartram, M.S., Assistant (Meat Curing).

BOTANY, PATHOLOGY, PHYSIOLOGY.

†† C. O. Appleman, Ph.D., Physiologist.
J. B. S. Norton, M.S., D.Sc., Pathologist.
C. E. Temple, M.S., Pathologist.
R. A. Jehle, Ph.D., Assoc. Pathologist.
Ronald Bamford, Ph.D., Assoc. Botanist.
Glenn A. Greathouse, Ph.D., Asst. Physiologist.
M. W. Parker, Ph.D., Assistant Physiologist.

ENTOMOLOGY.

E. N. Cory, Ph.D., Entomologist.
H. S. McConnell, M.S., Associate.
Geo. S. Langford, Ph.D., Associate.
L. P. Ditman, Ph.D., Assistant.
Geo. Abrams, M.S., Assistant (Bees).
C. Graham, M.S., Assistant.

HOME ECONOMICS.

Margaret Coffin, M.A.

HORTICULTURE.

J. H. Beaumont, Ph.D., Horticulturist.
T. H. White, M.S., Olericulturist and Floriculturist.
A. L. Schrader, Ph.D., Pomologist.
S. W. Wentworth, M.S., Associate Pomologist
* F. E. Gardner, Ph.D., Pomologist (Plant Propagation).
F. B. Lincoln. Ph.D., Assoc. Plant Propagation
H. B. Cordner, Ph.D.. Assistant Olericulturist.
W. A. Matthews, M.S., Assistant, Canning Crops.
Paul Marth, B.S., Assistant, Pomology.
J. B. Blandford, Asst.-Farm Supt.

POULTRY HUSBANDRY.

R. H. Waite, B.S., Poultry Husbandman.
Geo. D. Quigley, B.S., Associate.

RIDGELY SUB-STATION.

Albert White, B.S., Superintendent.

SEED INSPECTION.

F. S. Holmes, M.S., Inspector.
Ellen Emack, Assistant Analyst.
Ruth M. Shank, Assistant Analyst.
O. H. Faber, A.B., Assistant Analyst.
Olive Kelk, Assistant Analyst.
Elizabeth Shank, Assistant.

The Station is located on the B. & O. R. R., City and Suburban Electric Ca
Line and the Baltimore-Washington Boulevard, eight miles north of
Washington, D. C. Bell Telephone—Berwyn Exchange.

Visitors will be welcome at all times, and will be given every opportunit to inspect the work of the Station in all its departments.

The Bulletins and Reports of the Station will be mailed free of charge to all residents of the State who request them.

ADDRESS:
AGRICULTURAL EXPERIMENT STATION,
COLLEGE PARK, MARYLAND.

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* Agent U. S.Department of Agriculture.
† Assistant Director.
** Live Stock Sanitary Laboratory.
†† Dean of Graduate School.

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UNIVERSITY OF MARYLAND
AGRICULTURAL EXPERIMENT STATION

Volume 46 1932-33

THE FORTY-SIXTH ANNUAL REPORT OF THE MARYLAND AGRICULTURAL EXPERIMENT STATION

For Fiscal Year Ending June 30, 1933

By H. J. PATTERSON, Director

To the Governor of Maryland, the Board of Regents, and the President of the University of Maryland:

Gentlemen: In accordance with the requirements of the Acts of Congress and Maryland Legislature there are presented herewith condensed statements as to the nature and progress of the research work and activities, together with a financial statement showing the receipts and expenditures of the Maryland Agricultural Experiment Station for the fiscal year ending June 30, 1933. There are also appended the bulletins issued during the year, giving the results of investigations.

The workers during the year have been active in completing projects and compiling the results for publication. The year was closed with several bulletins prepared for publication which had to be held until money was available for printing.

Under the conditions which have confronted the farmers for several years, they have come to the Experiment Station in greater numbers for aid in solving the many problems which they are meeting. The variety and quantity of the farm problems has taxed the station's resources for research work.

Much of the effort of the research workers has aimed to help the farmers to produce more and better at less per unit cost. Efficiency in production is measured by holding the cost of a high quality of product sufficiently below its selling price to yield a fair profit. The efficient farmer is the one who makes a profit on his products, maintains a high standard of living in the home, and who cooperates in promoting community enterprises and standards. The research work aims to assist farmers in developing this degree of efficiency and standard.

FACILITIES AND EQUIPMENT

The new Horticulture Building was completed early in 1932. Much time and money has been expended during the year in equiping the laboratories for teaching and research work. This building and equipment has added greatly to the facilities for both teaching and research. Much more should be added to thoroughly equip the building; however, present facilities will make possible much good work.

The requirements as to land, greenhouses, temperature controlled storage, and laboratories for some phases of work as set forth in the 44th report still exist and it is hoped that economic conditions will soon be such as to enable the State to supply them.

PUBLICATIONS

The bulletins and papers published give a fair index of the results attained each year. The following is a list of those issued during the fiscal year:

BULLETINS

Bulletin Number	Subject	Author	Pages	Copies Issued
337	Organization and Management of Maryland Farms	S. H. DeVault and Ray Hurley	155-212	3,500
338	Economic Efficiency of the Farm Layout in Maryland	S. H. DeVault and A. B. Hamilton	213-260	3,500
339	Taxation in Maryland with Special Reference to Agriculture	W. P. Walker and S. H. DeVault	261-342	3,500
340	Salt Tolerance of Baby Chicks	Geo. D. Quigley and Roy H. Waite	343-370	2,500
341	Housing Conditions in Relation to Farm Labor Turnover	Margaret Coffin	371-411	2,500
342	Fish Meal Versus Cottonseed Meal As a Feed for Dairy Cows	L. W. Ingham	413-422	2,500
343	Maryland Seed Laws and Regulations	F. S. Holmes	423-433	2,500
344	Some Effects of Freezing on the Physical and Nutritional Properties of Milk	R. C. Munkwitz, M. H. Berry and W. C. Boyer	435-446	2,500
345	The Mosaic Disease of Tomatoes	J. W. Heuberger and J. B. S. Norton	447-486	5,000
	The Fusarium Wilt of Tomatoes	J. B. S. Norton	487-489	
	The Control of Tomato Diseases	J. B. S. Norton H. A. Hunter	490-494	
346	Sources of Food Used by Maryland Farmers	Margaret Coffin		3,000
347	Oat Variety Tests	J. E. Metzger		3,000
348	Corn Earworm Studies	L. P. Ditman and E. N. Cory		3,000
349	Industrial Alcohol by-Product Stock Food	L. B. Broughton, P. W. Frey and B. E. Carmichael		3,000
350	Hydrolysis of Fat of Home Cured Ham	W. C. Supplee and L. B. Broughton		2,000
	45th Annual Report	H. J. Patterson	I-XXVII	1,000

TECHNICAL PAPERS

The following is a list of the papers by members of the staff which have been contributed to scientific journals or presented before scientific societies. In many instances these represent reports of progress or research of value only to workers in the same field.

Auchter, E. C. and A. L. Schrader—Possibilities of Affecting Biennial Bearing in York Imperial Apples in the Cumberland-Shenandoah Valley. A. S. H. S., 1932.

Auchter, E. C.—With Low Prices Prevailing What Orchard Management Policy Should We Follow This Year, Md. State Hort. Soc., 1932.

Beaumont, J. H.—Problems in Potato Production in Maryland. Md. Veg. Growers' Assoc., 1933.

Beaumont, J. H.—Factors Influencing the Development of Red Color on Apples. Trans. Pen. Hort. Soc., 1932.

Beaumont, J. H.—Diagnosing Peach Problems. Md. State Hort. Soc., 1933.

Bishopp, F. C., Cory, E. N., and Stone, A.—Preliminary Results of a Mosquito Survey in the Chesapeake Bay Section. Proceedings of the Entomological Society of Washington, Vol. 35, No. 1, January, 1933, pages 1-6.

Cory, E. N.—Codling Moth and San Jose Scale—Two Orchard Pests Demanding Close Attention. Proceedings of the Maryland State Horticultural Society, Proceedings of the Thirty-Fourth Annual Meeting, 1932.

Cory, E. N.—Seasonal History of the Codling Moth. Transactions of the Peninsula Horticultural Society, Vol. 22, No. 5, Pages 98-101, 1932.

DeVault, S. H. and Hurley, Ray—Farming on Small Acreages in Maryland. (Mimeographed).

DeVault, S. H. and Walker, W. P.—Distribution of the Tax Dollar. (Mimeographed).

DeVault, S. H. and Agricultural Economic Staff—Outlook for Maryland Agriculture. (Mimeographed).

DeVault, S. H.—Markets for Maryland Wheat. Report of Maryland Crop Improvement Association, 1933, Pages 14-25.

DeVault, S. H.—Developments in Cooperative Marketing in 1932. Annual Report of National Association of Marketing Officials, 1932.

DeVolt, H. M.—Pullorum Disease in Turkeys. Meeting of Maryland State Poultry Association, June 15, 1933.

Ditman, L. P. and Cory, E. N.—Response of Corn Earworm Moths to Various Sugar Solutions. Journal of Economic Entomology, Vol. 26, No. 1, Pages 9-115, February, 1933.

Eppley, Geary—Uses of Maryland Wheat. Report of Maryland Crop Improvement Association.

Everson, C. L., Poelma, L. J., Brueckner, A. L. and Pickens, E. M.—A Study of the Brucella Abortus Agglutination Titres of the Various Farm Animals. Maryland State Veterinary Medical Association Meeting, December 8, 1932. Accepted for publication by Cornell Veterinarian.

Everson, C. L., Poelma, L. J., Brueckner, A. L. and Pickens, E. M.—Portals of Entry of Brucella Abortus in Guinea Pigs. Sixty-first Annual Meeting of A. P. H. A. in Washington, October, 1932. Accepted for publication in the Cornell Veterinarian.

Gardner, F. E. and Lincoln, F. B.—Factors Influencing the Variability of Apple Trees in the Nursery Row. 1. Time of Bud Start. Procedure American Society Horticultural Science, 1932.

Greathouse, G. A.—Osmotic and Leaf Temperature Gradients in the Soybean and Sunflower. American Society of Plant Physiologist Convention, December, 1932.

Harry, D. G., DeVault, S. H., Walker, W. P.—Report of Committee on Taxation. Annual Report of Maryland State Grange, 1932.

Haut I. C.—The Influence of Drying on the After-Ripening and Germination of Fruit Tree Seeds. Procedure of American Society of Horticultural Science, 1932.

Haut, I. C.—Catalase Activity in Relation to the After-Ripening of Fruit Tree Seeds. Procedure of American Society of Horticultural Science, 1932.

Hockom, Don W.—Ant Control in Baltimore Parks. Graduate School Letter, 1933.

Kemp, W. B.—Distribution of Different Varieties of Wheat in Maryland. Report of Maryland Crop Improvement Association.

Kemp, W. B.—Distribution of Varieties of Wheat in Maryland with Reference to Soil Type, Elevation, and Disease. American Society of Agronomy.

Kemp, W. B. and Henson, P. R.—The Effect of Type of Endosperm Upon Carbohydrate Distribution in the Mature Corn Plant. American Society of Agronomy.

Knight, Paul—Problems of Insect Study. Copyrighted by Edward Brothers. A Textbook on General Entomology. 118 mimeographed pages.

Langford, G. S.—Observations on Cultural Practices for the Control of the Potato Tuber Worm, Phthorimaea operculella Zell. Journal of Economic Entomology, Vol. 26, No. 1, Pages 135-137, February, 1933.

Langford, G. S.—Some Important Truck Crop Pests. Transactions of the Peninsula Horticultural Society, Vol. 21, No. 5, Pages 73-80.

Matthews, E. D. and Thomas, R. P.—The Effects of Previous Cropping on the Forms of Nitrogen in Collington Fine Sandy Loam. A. A. A. S.

OVER

McConnell, H. S.—The Parasites of the Strawberry Leaf-roller. Journal of Economic Entomology, Vol. 26, 1933.

McConnell, H. S.—Parasitism and Over Winter Control of Peach Moth. Transactions of the Peninsula Hort. Society, Vol. 21, No. 5, Pages 105-108.

Meade, D.—Some Conclusions Drawn From Eight Years of the Maryland Litter Contest. Maryland Stockmen's Association.

Metzger, J. E.—Some Factors Affecting Yield and Quality of Canning Corn. American Society of Agronomy.

Metzger, J. E. and Bruce, O. C.—Soils and Crops of Maryland (with map showing Soil Series). Pub. Baltimore Association of Commerce.

Munkwitz, R. C.—Using Surplus Milk Profitably. Nov., 1932, issue of Milk Dealer.

Norton, J. B. S. and Heuberger, J. W.—Factors Influencing Type and Sequence of Tomato-Mosaic Leaf Abnormalities. Water Loss in Tomato Mosaic. American Phytopathological Society Convention, 1932.

Parker, M. W.—A Physical and Chemical Study of the Soluble Polysaccharides of Sweet Corn. Amer. Soc. of Plant Physiologists Convention, December, 1932.

Pickens, E. M., Schillinger, J. E. and DeVolt, H. M.—Quail Disease. Published in the Maryland Conservationist (Spring issue, 1932).

Pickens, E. M.—The Accredited Flock. The Goal of Pullorum Disease Testing. Maryland State Poultry Association, June 15, 1933.

Quigley, George D.—Salt Tolerance of Baby Chicks. Monthly Seminar U. S. Dept. of Agricultural Workers in Poultry Husbandry Research.

Rothgeb, R. G.—Relationship Between Ear and Grain Characteristics of Corn and Yield. Report of Md. Crop Improvement Association.

Rothgeb, R. G.—Interrelation Between Certain Tassel and Ear Characters in Corn. American Society of Agronomy.

Schrader, A. L.—Effect of the Relative Vigor of Vine at Planting on the Fruiting and Growth of the Concord Grape. American Society Horticultural Science, 1932.

Schrader, A. L.—Effect of Defoliation on the Fruiting of Concord Grape Shoots. Amer. Soc. Hort. Sci., 1932.

Schrader, A. L.—The Effect of Nitrogen, Potassium, and Phosphorus on the Shipping and Keeping Quality of Fruit. Maryland State Horticultural Society, 1932.

Schrader, A. L. and Beaumont, J. H.—Measuring Apple Color with a Disc Colorimeter. American Society of Horticultural Science, 1932.

Schueler, J. E. and Thomas, R. P.—Determination of Potassium by Sodium Cobaltinitrite. Ind. and Eng. Chem., Vol. 5, Page 163, 1933.

Temple, C. E.—Progress Report on the Development of Wilt Resistant Peas in Maryland. Tri-State Packers' Association. Published in Canning Trade, January, 1933.

Waite, Roy H.—Recent Experiments at the Poultry Experiment Station of the University of Maryland. January Meeting of Maryland State Poultry Association.

Waite, Roy H.—Poultry Feeds from Home Grown Grains. Centerville Poultry Show, November 16, 1932.

Waite, Roy H.—Pedigree Breeding for Standard Qualities. Summer Meeting (June 15), Maryland State Poultry Association.

Waite, Roy H.—Straw Makes Good Brooder House Litter. Maryland Farmer, January 16, 1933.

Waite, Roy H.—Winter Eggs. The Farmers' Poultry Journal.

Waite, Roy H.—Early Pullets. The Farmers' Poultry Journal.

White, T. H.—Maryland Golden Sweet Potato. Report Maryland Vegetable Growers' Association, 1933.

Woods, M. W.—Intracellular Bodies in Ring-Spot. American Phytopath Society Convention, December 26-30, 1932, Atlantic City.

Woods, M. W.—5,000 Word Article on "Intracellular Bodies in Ring-Spot." Pub. Contributions from the Boyce Thompson Institute for Plant Research.

CHANGES IN STAFF

There were no resignations or appointments during the year. Two members of the staff were removed by death:

R. C. Munkwitz, M.S., Associate, Dairy Manufacturing, died January 6, 1933. He had served in this capacity faithfully, efficiently and satisfactorily from 1925.

E. M. Pickens, A.M., D.V.M., Animal Pathologist and Bacteriologist, and Pathologist of the Biological Laboratory and Livestock Sanitary Service, died June 13, 1933. He had been connected with the University since 1918. He administered the varied, and at times, difficult, duties of his position with promptness and thoroughness and to the satisfaction of all. He contributed much to the development and protection of the livestock interest of Maryland and promoted a better appreciation of the necessity of observing good sanitary measures with both man and animals.

SERVING MARYLAND AGRICULTURE

FARMERS HELPED BY RESEARCH

Over sixty years ago Samuel W. Johnson, the author of "How Crops Feed" and "How Crops Grow," said that the function of an Agricultural Experiment Station was to "put science at work for Agriculture." This function has been met by the Maryland Station and also by all the others in the United States. The Experiment Stations have demonstrated their ability to serve and the results are contributing much for the small amount expended. The results of the research are not only of value to farmers but have helped every person no matter where he lives or what his occupation.

Agricultural research in recent years has shown a marked trend towards becoming more fundamental in character. There has also developed a spirit of cooperation among the specialists in the different sciences which is proving fruitful. The farmers' problems with any particular industry or crop are frequently of a nature that the satisfactory solution or handling of them and the maintaining of a proper balance will require the help or application of two or more sciences.

In order to show the problems and the contributions made by different sciences towards their solution, the research work relating to some of Maryland's major industries and crops will be discussed under the commodity heading rather than by research departments.

MARYLAND'S MAJOR AGRICULTURAL COMMODITIES

Average for 5 years (1925-29)

Rank	Commodity	Farm Value
1	Milk	$21,630,000
2	Corn	18,883,000
3	Poultry—Chickens, Eggs, and Turkeys	15,323,000
4	Wheat	13,005,000
5	Hay	10,049,000
6	Truck Crops	9,025,000
7	Tobacco	5,697,000
8	Hogs	5,405,000
9	White Potatoes	5,194,000
10	Cattle	3,863,000
11	Strawberries	3,374,000
12	Orchard Fruits—Apples, Peaches, Pears	3,150,000
13	Sweet Potatoes	1,623,000
14	Sheep and Wool	965,000
15	Greenhouse Products	932,000

From the figures in the above list it will be noted that there are fifteen major commodities in Maryland with an annual farm value of approximately one million dollars or more. There are five commodities with a farm value ranging from 10 to 21 million and nine with values of over five millions of dollars.

In some respects it may be the obligation of research to expend efforts on behalf of the various commodities in proportion to their value; yet on the whole the effort probably should be based on the problem and its estimated reaction rather than gross values. Again a commodity with a relatively small gross value may present a problem of relatively great and grave importance to a small section and a few people. It can readily be understood that no rule can be established for allotting funds to research problems. However, it may be interesting to point out and recite the different sciences which are at work on some of the problems relating to the major agricultural commodities and the services they are rendering the farmers.

The following summaries have been largely compiled and copied from the Reports submitted by the Heads of the different station departments.

MILK AND DAIRY PROBLEMS

In an effort to solve some of the problems confronting the dairy industry, the station has in progress 32 projects. These are distributed in the departments of Agricultural Economics, Agricultural Engineering, Agronomy, Animal Pathology, Bacteriology, Botany, Entomology, and Chemistry. These projects involve some time and attention from twenty-five members of the scientific staff. In addition to these research workers several members of the Extension and Control staffs are serving as agencies to bring the dairy farmers' problems to the attention of the investigators helping to plan the projects and also telling the farmer of the Station's results.

The following results obtained this year are worthy of special note:

The Economics Department in 1932 compiled management records for 184 dairy farms. The farms which were designated as "dairy farms" were those where the sale of milk constituted 40% or more of the total receipts. Both the Baltimore and Washington, D. C., milk sheds were represented in the distribution of the farms studied. The results showed that the farms averaged 153 acres in size. The herds averaged 16.4 cows. Farm receipts averaged $3,112 and abor income averaged $365. The farmers' income ranged from $4,500 to minus $2,688. The best incomes were due to the following factors: (a) efficient use of hired labor; (b) greater production per cow; (c) larger sized herds and more animals in production; (d) even production throughout the year; (e) higher crop yields per acre; (f) relatively low investment in buildings and equipment. The efficient layout of the farm and buildings contributed towards increasing the farm income.

The Milk Situation in Maryland as compared with other markets was studied. The detailed report has been distributed in mimeographed form. The following table gives a summary as to prices of milk.

TABLE 1. CLASS I OR BASIC PRICES PER 100 POUNDS 3.5% MILK, F. O. B. CITY

Year	Hartford[1]	Boston[1]	New York[1]	Philadelphia[2]	Baltimore[2]	Washington[2]	Milwaukee[2]	Pittsburgh[1]	Minneapolis[1]
1921	$3.92	$4.00	$3.80	$2.96	$3.08	....	....	$3.05	$2.65
1922	3.56	3.44	3.62	2.74	2.77	....	....	3.03	2.44
1923	3.89	3.86	3.76	3.29	3.33	....	....	3.67	2.82
1924	3.95	3.44	3.39	3.16	3.30	$3.30	$2.76	3.57	2.45
1925	4.02	3.72	3.78	3.18	3.34	3.26	2.48	3.60	2.64
1926	4.11	3.86	3.82	3.22	3.37	3.41	2.80	3.51	2.55
1927	4.22	3.95	3.92	3.50	3.55	3.53	2.92	3.68	2.69
1928	4.22	4.05	4.02	3.50	3.55	3.50	2.98	3.48	2.80
1929	4.34	4.14	4.19	3.61	3.55	3.50	3.00	3.56	2.75
1930	4.22	4.09	4.04	3.51	3.54	3.50	2.96	3.14	2.35
Average 1926-30	4.22	4.02	4.00	3.47	3.51	3.49	2.93	3.47	2.63
1931	3.63	2.98	3.58	2.98	3.01	3.35	2.48	2.55	1.86
1932	2.76	2.56	2.57	2.30	2.57	3.03	1.85	1.72	....
1933 January	2.59	2.29	2.32	1.98	2.26	2.79	1.60	1.30	....
February	2.59	1.80	2.32	1.98	2.26	2.90	1.60	1.30	....
March	1.89	1.80	2.13	1.98	2.26	2.90	1.65	1.30	....
April	2.24	1.80	2.13	1.98	2.36	2.79	1.76	1.55	.50
May	2.24	1.80	2.08	1.98	1.91	2.91	1.76	1.55	....
June	....	....	2.68	2.27	1.80	....	....	....	....

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[1] Prices for milk sold in fluid form.
[2] Prices for "basic" milk.

Milk Cooling: The Department of Agricultural Engineering conducted some investigations as the cooling of milk, with particular reference to the conditions which existed on the Eastern Shore area of Maryland. Some data was obtained as a relative efficiency of different systems available. The results were presented at farmers' meetings and in mimeographed bulletins.

The Engineering Department, in cooperation with the National Rural Electric Project, has been at work on a dairy utensil sterilizer, an electric milk pasteurizer for small quantities, and a dairy water heater. Substantial progress has been made. The sterilizer and water heater are both efficient and economical. The pasteurizer gives much promise. There is much need for such a pasteurizer, as it will enable milk producers and dealers to supply small communities with pasteurized milk, which is very desirable under some circumstances.

The following contributions were made by the Dairy Department:

Feeding Experiments: A comparison of fishmeal and cottonseed meal as a protein feed for dairy cows showed:

Fish meal may be fed to dairy cows with satisfactory results. See Bulletin No. 342.

Calf Feeding: Rations for calves developed and tested by the Station showed that calves can be raised to six months of age for $20.24 to $22.51; less than by the usual methods followed.

The use of skim milk powder, blood flour and fish meal as sources of protein in rations for calves indicates that:

1. The addition of a large percentage of skim milk powder to the grain rations of dairy calves, after they had had a good start on milk, incurred greater expense than the results would justify. Comparing blood flour with fish meal as a component of a dry grain ration for dairy calves showed no appreciable difference between these two feeds on the basis of growth produced. Fish meal proved superior to blood flour in that the calves had a finer finish and a more thrifty general appearance. Fish meal cost less than blood flour.

2. The growth results, costs per pound of gain, and general body conditions secured with a group of calves fed a grain mixture combining skim milk powder, fish meal and blood flour were very satisfactory.

A study of the effects of freezing on the physical and nutritional properties of milk gave the following results:

1. The nutritive value of milk is not impaired by freezing as evidenced by the growth data, by the calcification of femur bones and by the fact that all rats were in a good physical condition at the end of the experiment.

2. Freezing causes a partial precipitation of the milk solids. Albumin is precipitated in the greatest amount, followed in order by lactose, total protein, ash, casein, total solids and fat.

3. With the exception of the fat, the amount of preciptation of the solids increases as the length of time of freezing increases. Freezing causes the fat globules to clump together and to become distorted and irregular in size and shape.

These results have a very practical application both to the consumer of milk and to commercial plants. Milk is often delivered to the household in a partially or completely frozen condition and commercial plants often hold milk and other dairy products for various periods of time in a frozen state. This work therefore answers some important questions which are raised respecting the effect of freezing upon the physical and nutritional properties of milk.

Contagious Abortion in Station Herd.

Since June 14, 1929, when the positive and negative animals in the Station herd were completely separated and frequent blood tests made thereafter, only one suspicious animal has appeared. No positive reactors have occurred in the herd within the current year.

The Department of Bacteriology and Animal Pathology have an extensive series of experiments in progress on Abortion in Dairy Cows.

State Testers Licenses.

The Dairy Department conducted for the State Board of Agriculture during the past year four examinations for milk and cream testers.

The Department of Entomology has contributed much help from time to time in testing sprays for preventing flies on cows. The effects of those tested were lost in a relatively short time and their cost was relatively high.

The Agronomy Department has completed several projects with forage, hay, grain and crop rotations that will prove helpful to dairy and other live stock interests. Winter barley in the dairy farm rotation proved of particular value. These are given in detail under the discussion of the several crops.

Corn, Wheat, Hay

These three crops represent an annual farm value of nearly forty-two millions of dollars and they occupy about one and one-half million acres. From point of value, area and number of farms growing them, they represent more than all other crops combined. The corn and hay crops are used chiefly as feed for live stock, consequently of much importance to the dairy industry.

Accomplishments and Importance of Agronomy Work—1932-1933. It seldom occurs that an agronomy project is completed in the year in which it is begun. Any statement of accomplishments and importance of work for the year must of necessity represent activities covering a period of at least several years, and can be only a general estimate of anticipated scientific and applied value.

The forage crop work in alfalfa, soybeans and mixed hay is developing the response relations of varieties and strains to both summer and winter conditions in this latitude. With alfalfa some of the northern seed lots are not very superior to those of the extreme south because of their unfavorable response to summer temperatures.

Our wheat variety work first attracted wide attention because of the relations between weather factors and yield response. This work has been extended to the point where it was possible during the year to construct a map of the State showing the location of the kinds of wheat grown and the areas to which they should be extended.

The smooth awned winter hardy strain of barley (winter-spring hybrid) is now ready for production in quantity. A smooth awned winter hardy strain has been developed.

Alfalfa

In 1932 hay yields from the alfalfa plots seeded in 1928 did not cause any material difference in the relative standing of the various strains. From the results secured to date strains of alfalfa grown in Kansas and states north might be recommended for Maryland conditions. Turkestan is not vigorous and Arizona killed out. The following table shows how the various strains yielded in relation to highest yielding strain in any one year and the four-year average.

RELATION TO HIGH YIELDING PLOT

Strain	1929	1930	1931	1932	Relation of 4-Year Average
Kansas (Commercial)	92	75	87	82	89
Grimm Utah	88	88	90	89	93
Arizona	46	56	81	60	67
Northern Grown	85	82	85	92	91
Kansas (Commercial)	90	86	96	95	91
Grimm Montana	76	100	97	91	96
Argentine	100	88	97	94	100
Montana Common	85	90	100	100	100
Turkestan	47	82	82	76	75
Cossack	83	100	97	95	99
Montana Variegated	65	97	92	89	89

Hay for Sandy Land.

No new results were secured since the last report from the experiment testing hay grasses on sandy land but this experiment is being continued because of the promising results shown by tall meadow oat grass.

Now that good quality tall oat grass seed is available at reasonable prices it is very essential that its place in our Maryland agriculture be established.

Fescues.

In the test of Red Fescue from twelve different sources the Bavarian strain has produced the best sod and is outstandingly different from the others. Because of its promise it will be placed in increase plots for seed.

Wheat

Head selection of the Leap variety taken from the nursery to the field plots in 1927 continue to show superiority. Yields in bushels per acre at College Park for Leap and its best selection are as follows:

	1928	1929	1930	1931	1932	Ave.
Leap	35.9	34.4	45.9	33.2	26.2	35.1
4823-25-41	37.0	38.8	55.2	36.1	28.5	39.1

Not only has this selection out-yielded its parent every year in five, but during the same period has made the highest average of all varieties on test. It has exceeded its nearest competitor by 2.2 bushels. A limited amount of seed of 4823-25-41 has been distributed under the name of Leapland. The superiority of Leapland appears to be due to a quick, vigorous start in the spring.

Eradication of Crabgrass and Weeds.

Of the 20 chemicals which have been used 3 are promising from the standpoint of controlling crabgrass and other weeds in turf areas. These chemicals are (a) chlorates (sodium and calcium), (b) arsenicals (pentoxide, arsenates, arsenites), (c) thiocyanates (ammonium). There still remains the determination of the concentration of chemical to use depending upon the season of the year and the stage development of the weed to be controlled. Tests for the securing of this information are in progress at the present time. Of the chemicals used the chlorates are the most promising.

As the crops raised on the Station farm are mostly used by the dairy herd, it may be of interest to record the cost of producing grain and forage crops on Station farm at College Park, in 1932 as given in the following table.

NET VALUE OF CROPS AND A SUMMARY OF PRODUCTION COSTS—1932

Crop	Acres	Yield	Value	Cost of Production	Net Value	Yield Per Acre	Value Per Acre	Cost Per Acre	Net Value Per Acre
Ear Corn	9.75	430.00 bus.	$266.62	$200.85	$65.77	44.10 bus.	$27.35	$20.60	$6.75
Corn Silage	8.00	80.00 tons	480.00	176.48	303.52	10.00 tons	60.00	22.06	37.94
Wheat*	13.30	248.00 bus.	401.60	268.26	133.34	18.65 bus.	30.22	20.17	10.05
" Straw	....	19.00 tons				1.43 tons			
Barley*	4.00	190.00 bus.	171.50	71.76	99.74	47.50 bus.	42.87	17.94	24.93
" Straw	....	4.00 tons				1.00 tons			
Mixed Hay	12.00	31.50 tons	472.50	164.16	308.34	2.625 tons	39.37	13.68	25.69
Soybean Hay	3.80	7.885 tons	205.01	54.72	150.29	2.075 tons	53.95	14.40	39.55
Soybeans	4.00	47.00 bus.	47.00	59.92	—12.92	11.75 bus.	11.75	14.98	—3.23
			$2,044.23		$1,048.08				

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* Cost of baling and storing straw was $1.84 per ton. The cost per acre was $2.63 in the case of the wheat straw and $1.84 *for* the barley straw.

In addition to the somewhat lower costs per acre for all the crops the relative cost of producing barley and wheat is of special interest. By taking the cost of producing barley as a unit, wheat production costs were actually 12.4 per cent higher per acre. A very slight factor in this was the greater distance for hauling the wheat to the thresher. By using commercial prices the acre value of the barley was approximately 2.5 times the acre value of wheat. Barley has maintained a favorable relation with reference to wheat since about 1920—a fact that has been used to a considerable extent in encouraging farmers to grow feed barley.

POULTRY

As indicated in the table, poultry contributes much to the farm income. Because of the size of the investment, labor involved and general overhead expenses and quick turn overs, it probably gives a larger net return than some other commodities which represent a higher farm value.

The Poultry Department completed an exhaustive study of the poultry house floor. The results showed a properly constructed cement floor was superior to wood. The flock on the cement floor had a lower mortality and gave better returns than the one on wood floor. This piece of research is stimulating other research on house construction based on scientific physical principles. The bulletin giving the results of the poultry house floor study has met with favor in all parts of the United States but has been requested by many foreign countries, including Russia and China. The demand for the bulletin giving the results of the poultry house floor study has been so great as to necessitate a second edition.

A study of the salt tolerance of baby chicks has disclosed that the superficial observations and ideas of many poultrymen were erroneous and that chickens may eat much more salt, without harmful results, than was formerly thought possible. (See Bulletin No. 340.)

The Poultry Department has rendered much help to poultrymen and feed manufacturers in the preparation of rations suited to farm and local conditions and using to a large extent home grown or local grains.

The Poultry Department has cooperated with the feed control division of the Chemistry Department in testing feeds suspected of being deleterious, also in testing the efficiency of various brands of cod liver oil and meal.

The Department of Bacteriology and Animal Pathology has several research projects under way in studying the blood testing of chickens for their reaction to bacillary white diarrhea, chicken pox, and blackhead in turkeys. Considerable progress has been made in these investigations.

The Department of Agricultural Economics has made two surveys of much value to poultrymen. The results of the study of the 99 poultry farms showed that they produced an average income of $883 and an average labor income of $492. 78 of the farms produced a profit. The average receipts per farm were $3,387. The average expenses per farm were $2,504. Feed represented about 50% of the expense and labor about 12%.

Poultry farmers should strive to increase their incomes in the following ways: 1. Obtain farm receipts of at least $4,500. 2. Have an egg production per bird of 140 eggs or more. 3. Make a rapid capital turnover so that receipts will equal capital in two years. 4. Strive to obtain maximum efficiency in production. (a) Receipts from the sale of eggs and poultry should be 2½ times the feed cost; or, in other words, egg and poultry sales should be $2.50 per $1.00 of feed cost. (b) Labor should be used efficiently, with the view in mind of keeping labor expense to no more than 16 per cent of the farm receipts. 5. Strive to improve marketing methods in order to obtain a higher net price for eggs and poultry.

These goals can be obtained by:

a. Concentrating operations around the poultry enterprise. Large flocks, composed of good quality birds, properly managed and cared for, should be kept in order to provide for efficiency of operation.

b. Developing one or two good minor enterprises that will not interfere with the care of the poultry or the marketing of poultry products.

c. Keeping farm accounts and studying the farm business in order to correct the weak points in the organization and operation of the farm.

d. Taking advantage of better marketing possibilities. The keynote to successful poultry farming is economical and efficient production and marketing.

In the economic study of the turkey industry, records were obtained of 147 flocks, located in the counties majoring in this enterprise. Effort was made to confine the study to those farms where 100 birds or more were raised in 1931, or to farms that kept as many as 10 breeding hens. Production practices were studied, income, costs and profits of the business were ascertained and an analysis was made of the data to determine the factors affecting profits.

The average flock numbered 284 birds. The investment per flock was $736, or $2.59 per bird. The average income was $1,273 per flock, or $4.49 per bird. The average costs per flock were $975, or $3.44 per bird, and the net profit was $300 per flock, or $1.05 per bird. The flocks raised by artificial incubation and brooders were larger than those raised with hens and, even though the profit per bird was smaller, the profit per flock was greater. Feed costs, which made up 50 per cent of the total costs, were greater for the least profitable flocks than for the most profitable ones. Labor cost, constituting 25 per cent of all costs, was greater per bird for the smaller flocks. The most profitable flocks were raised by natural methods, which required only a small investment in buildings and equipment. The larger the flock, the greater the profit per flock, although the smaller the profit per bird. The most profitable flocks had a low percentage of mortality. The most profitable flocks were given free range. Mash was fed to about 61 per cent of the flocks. The most profitable method of marketing the birds was direct to the consumer. It was more profitable to market the birds dressed; 32 per cent of all birds were sold dressed.

A preliminary survey as to consumers' preference and market demand for eggs in Washington has been of great help in organizing the egg producers of Southern Maryland, and enabling them to supply what consumers desire.

TRUCK AND CANNING CROPS

Because of market, soil, and climatic conditions, Maryland farmers are largely engaged in the growing of truck and canning crops and consequently they have received much attention by the Station. Almost every department has some project relating to these crops. The research problems relate to every stage from the breeding and production of seed to the maturity of the crop and the marketing of the same so as to furnish the consumer a high quality which is pleasing, palatable and nutritious at an economical price and yet give the producer a satisfactory net return.

While good soil, fertility, culture and business methods are paramount for success; yet under the best of management and conditions diseases and insects will present many serious problems which if unrestrained would soon wreck the industry. Reference to the list of projects will disclose that a large per cent pertain to truck and canning crops.

Sweet Corn.

Seed Production and Breeding. Four lines of work were carried on in 1932, namely, (1) variety and hybrid testing, (2) improvement of a local variety, Hopeland, (3) production of inbred lines, and (4) adaptation of Connecticut strains to Maryland conditions.

Variety and Hybrid Testing. These tests have been conducted annually for the purpose of studying hybrid and varietal performance. A detailed record is kept for each test entry. Plant characteristics, disease resistance, freedom from worm injury, and yield on quadruplicate plots at the canning stage constitute the observations made.

In 1932 a total of 45 entries were grown in the field trials. Among this material was Golden Cross Bantam, a yellow hybrid produced at the Indiana Station. Its performance was probably the outstanding feature of last year's test. Its vigor, uniformity, and yield were exceptional.

By cooperating with the producers of new strains of sweet corn in testing their material we are not only aiding the producers but we protect the Maryland growers from the use of unadapted seed.

Improvement of Hopeland. The attempt to refine this sugar-dent hybrid was continued in 1932. Selections for flavor and tenderness were made. Mass selection as well as inbreeding and subsequent crossing are both being practiced. Last year more than 100 inbred lines were started. The aim is to inbreed these lines for three or more generations and then combine those with desirable characters.

In 1932, as one means of selection, total sugar was run on both parents and progenies, the latter being for both dry ears and ears at the canning stage.

Production of Inbred Lines. Some forty inbred lines were selfed in 1932. Most of them have now been inbred for five or more generations and are now suitable for crossing.

Adaptation of Connecticut Strains to Maryland Conditions. In cooperation with Associated Seed Growers, Inc. of Connecticut, strains of their Evergreen, Narrow Grain Evergreen, and Country Gentleman varieties were grown in isolated plots near Westminster. From each plot seed was selected for similar plots in 1933.

Fertilizer Requirements of Sugar Corn for Canning. The work on this project was conducted during the years of 1929 to 1932. It pertains to the general problem of fertilization of sweet corn to be used for canning purposes.

The indications are that the ratio of the units of nitrogen to units of phosphorus should be about 1 to 4 for the Piedmont area and 1 to 3 for the Coastal Plains. In both localities the ratio of phosphorus to potash should be about 2 to 1. An analysis of

3-12-6 is recommended for Western Maryland and 4-12-6 for the Coastal Plains, unless large quantities of manure are used in addition to the fertilizer. Increased yields were secured with quantities as high as 800 lbs. per acre, but net returns decreased for applications of more than 400 lbs. Applications of 800 and 1000 lbs. per acre actually injured the crop in some seasons, causing considerable "firing" of the lower leaves. On most farms it would be best to place the fertilizer in a narrow band near the hill of corn rather than broadcast it over the field before planting.

A report of this project has been published by the Journal of the American Society of Agronomy.

A chemical study was made by the Department of Plant Physiology of the soluble polysaccharides in sweet corn. These studies were made on Stowell's Evergreen and Hopeland varieties with crops of 1931 and 1932.

The investigations conducted by the Horticultural Department have shown that soil fertility has a direct influence upon the rate of development of corn. Not only is the vegetative period between seeding and silking shorter on a fertile soil but the period from silking to maturity is also shorter. The chemical composition and canning quality undergoes more rapid changes on such a soil. The canner would need to watch his better fields more closely than those of lower fertility in order to harvest at the proper time.

The relationships of cut off weights and yield according to tentative U. S. grades of corn indicate a real justification for the canner to buy on grade and to pay for quality.

Corn Earworm. During the past year the corn earworm project has been actively carried on, with two objectives in mind; first, the development of direct and indirect control measures that will be economical and practical for use by farmers and canners in reducing the injury caused by this insect; and second, a study of the factors influencing successful hibernation.

The work on indirect control measures during the past year included an extensive study of those characteristics of sweet corn, i. e., length and tightness of husk, which are correlated with degree of injury to the ears. Direct measures of control attempted included the use of attrahents and repellents against the adult insects. Field tests were made with materials known to have repellent action toward the Japanese beetle. Preliminary laboratory and field tests were made to determine the attractiveness of various sugars and syrups to the moth in order to determine the most effective bait for further control experiments. See Bulletin No. 348.

Peas. This is one of the important canning crops in Maryland. For many years the crop was largely confined to the tide-water areas but it has gradually pushed westward until now some of the highest quality peas are grown on the mountain farms of Garrett County. In some sections pea diseases have greatly reduced yields and lowered quality. In some instances entire crops have been killed. Some years the pea aphis has caused much loss.

The Breeding of Peas Resistant to the Wilt Disease. This project which was begun in 1918, has resulted in the production of a large number of pure-line and pedigreed strains of peas that are 100 per cent resistant to wilt. Some of these are more prolific and of better type than the commercial canning varieties now in use. About 10,000 pounds of the seed of one strain dedeveloped under this project and named Maryland Alaska was sold in 1933 to Maryland canners at the price of ordinary pea seed. A part of the remaining supply of seed of this variety amounting to more than 50,000 pounds was prorated among seedsmen at about twice the price of commercial seed. What was left (about 8,000 pounds) has been planted in Idaho for multiplication and will be available for distribution for the 1934 sprng planting. This variety has had a very good reception by canners, growers, seedsmen and horticulturists.

During the past winter, 56 pounds of seed made up of three promising strains were multiplied in Mexico and the 713 pounds resulting therefrom has been planted at Moscow, Idaho. A favorable season should produce at least 7,000 pounds of seed. Small lots of seed of these three strains were planted at Silver Run, Maryland, in 1933 on soil thoroughly infested with wilt and root rot. They were rather outstanding in vigor and productivity. So much so, in fact, that they attracted the attention of the field-meeting visitors when forty-four men from six states besides Maryland inspected the plots.

It would now appear as if the wilt of peas may have been a blessing in disguise, since it has been the stimulating influence back of the work that has produced better varieties of peas for both canners and market gardeners. Even though the control of wilt has been solved, the production of wilt resistant varieties suitable to special conditions and uses should continue, and, too, certain fundamental aspects of the project should receive attention.

Hundreds of hybrid peas, mostly in the third generation, have been grown on woven wire trellises for individual selection. Several thousand wilt resistant and otherwise promising individuals will be selected in an attempt to obtain peas of superior quality and resistant to other diseases besides wilt. If glass houses were available, the work could be pushed more rapidly and as much done in one year as can be accomplished in three with ordinary out door conditions.

Pea Aphis. An outbreak of the pea aphis appeared early in Patapsco Neck on alfalfa, but an entomogenous fungus practically wiped out all of the aphids in the space of one week and there was no recurrence of the pest in that area.

In July an outbreak occurred on canning peas in Garrett County. Tests of spray solutions were made on six farms, the results are appended. It required approximately 100 gallons of spray per acre to make the application.

SPRAY EXPERIMENTS FOR THE CONTROL OF THE PEA APHIS (ILLINOIS PISI) MOUNTAIN LAKE PARK, MARYLAND, JULY 15TH AND 16TH, 1932

Place	Material Used	Total Number of Aphids Counted	% Alive	% Dead
Ray Winters	Pyrethrol—1 gal. to 200 gal. of spray	53	43	57
Baker Farm	Penetrol—1 gal. to 200 gal. spray plus nicotine—1 pt. to 200 gal. spray	574	42	58
Swartzen-Truber Farm	Chipso soap—4# to 100 gal. spray plus nicotine—1 pt. to 100 gal. spray	199	26	74
Albert Smouse's Farm	Potassium soap—4# to 100 gal. spray plus nicotine—1 pt. to 100 gal spray	272	20	80
Ben Friend's Farm	Potassium soap—4# to 100 gal. spray plus nicotine—1 pt. to 100 gal. spray	111	40	60
Ben Friend's Farm	Pyrethrum—1 gal. to 600 gal. spray			

Tomatoes:

Effect of Fertilizer Treatments Upon the Quality of Tomatoes. This project was started in 1928 to see if it were possible to influence the quality of tomatoes by fertilizer treatments. The field work of this project was discontinued with the 1931 crop of tomatoes. The quality of the fruit was judged by running sugar determinations and scoring the canned product. Chemical analyses were made of the dried fruit in order to see if the fertilizer treatments effected the ingredients taken up and stored in the fruit of the plant. These chemical analyses were completed this winter. Nitrogen fertilizers caused an increase in the nitrogen content of the fruit. Phosphate fertilizer had little influence on the phosphate content of the fruit. The potassium content of the fruit increased with the amount of potash in the fertilizer. Results indicate that any fertilizer treatment which increases the yield also increases the quality of the fruit. The results of this investigation are being prepared for a bulletin to be published by the Station in the near future.

The Botany Department has some studies in progress on the relation of plant nutrition to disease in tomatoes. Also on the symptoms manifested when there is a deficiency or an excess of certain elements. The results are rather pronounced and give promise of some valuable practical applications.

The results of the studies on the diseases of the tomato have been summarized and issued as a bulletin. Care in handling plants in the bed, setting, and cultivation are important in the control of mosaic. The control of insects in greenhouse tomatoes is also important in preventing mosaic.

Field tests conducted since 1912 show that tomato wilt is no longer a serious menace when wilt resistant varieties are used.

During the past year the manner in which tomato leaf spot Septoria penetrates the plant has been determined. With this information as to the way the fungus causes the disease some means for preventing it may be worked out. The determination of the cause is a distinct scientific contribution to understanding the life and structure of this and other like fungi.

ORCHARD FRUITS

Biennial bearing of the York Imperial variety of apples is one of the most important practical problems with which the orchardist in the Cumberland-Shenandoah Valley must contend. Many years of investigation have shown that the biennial bearing tendency may not be controlled by special fertilization, by special pruning practices or by cultural treatments, as reported for other varieties and in other sections. Recent investigations, however, indicate that early, heavy thinning may be important. Observations on the effect of partial defloration by frost support these results. This suggests that thinning, possibly combined with special pruning and fertilization may be the solution to the problem.

The development of a bright red color on apples is of great economic importance to eastern growers. Investigations have been in progress for a number of years to find ways and means by which the grower might economically influence apple color. Of the factors investigated an adequate healthy leaf area per fruit, optimum soil moisture, and sufficient intensity of light are of major importance. Thinning of fruits, pruning, and soil organic matter, but especially thinning, assume greatest importance. Applications of sugar to the soil may affect the development of color but this practice as well as that of injecting or fertilizing trees with chemicals of different sorts does not appear promising. Moderate cropping of thrifter trees, adequately supplied with moisture, will generally yield highly colored fruit.

Nitrogen fertilizer applications have given best results in growth and yield when scattered over the area under the spread of the branches. Trees in sod with mulch placed under the trees grow and fruit well if sufficient nitrogen fertilizers are applied. Trees in sod have a high concentration of fibrous roots in the upper six inches of soil, whereas trees in cultivation have the fibrous roots at a greater depth. Greatest economy in applying soluble fertilizers is obtained when these are applied in the regions of greatest root population.

Thinning of blossom clusters of grapes just before the blossoms open results in larger bunches. The degree and type of thinning to get profitable results is under investigation. Early development of leaf area per shoot is important in setting of grape fruits as well as development of size of berries. It is likely that with a greater demand for quality in grapes, thinning for size and quality of bunch may become an important practice.

The important consideration of planting distance of peaches in relation to profitableness, total yield, size and quality of crop is being investigated. The results of this experiment should answer some of these very important questions and form a basis for a more logical management program for the peach orchard. Already it is apparent that too close planting is affecting size and grade of fruit. This combined with the expense of removing trees may not justify the larger early yields obtained.

Nursery stock investigations in addition to giving consideration to profitable fertilization and propagation, are dealing with the important problem of securing, by breeding and selection, stocks which will be resistant to wooly aphis, root rot and other diseases. Root troubles are the direct cause of many spotted, irregular and unprofitable orchards. They do cause waste of fertilizers, spray materials, time, energy, and money for the grower. Progress in controlling diseases of fruit tree stocks is being made and in the course of a few years it is hoped to introduce stocks which will not only be resistant to many root troubles but which will produce more uniform and better yielding trees as well. Uniformity and longevity are important from the standpoint of planting distance, annual cropping, and other orchard economies.

Codling Moth. The Codling moth investigations were conducted at Hancock, particularly with reference to the use of calcium arsenate in combination with Sulfocide. A summary of this work was published in the report of the State Horticultural Society for 1932.

The check row was a fair demonstration of what would happen to an orchard if it was not sprayed at all. Records show that 67 per cent of the fruit was scabby, 17.9 per cent was wormy, with only 25 per cent being clean.

Where Sulfocide was used as the fungicide there was an average of 5.6 per cent of the fruit scabby, whereas where lime sulphur and Bordeaux were used as the fungicides, only 2.22 per cent of the fruit was scabby.

There was very little difference in the amount of codling moth injury in the plots where calcium arsenate or lead arsenate were used as the insecticides. The average per cent of wormy fruit in the calcium arsenate plots was 4.14, and the average per cent in the plots where arsenate of lead was used as the insecticide was 3.81.

Field work to determine the seasonal history was conducted at the Hancock laboratory and a survey was made of the entire State to ascertain the average of clean fruit. For Western Maryland the average clean fruit was 94.7 per cent, for Central Maryland 86.8, and for the Eastern Shore 60.63.

POTATOES (WHITE AND SWEET)

Potato breeding investigations, which are cooperative with the Office of Horticultural Crops and Diseases, U. S. Department of Agriculture, have brought to Maryland the results of all previous work of that office and new work is progressing rapidly. Two varieties have recently been named, the Katahdin and the Chippewa. Others are showing such merit as to warrant naming in the near future. These are being increased by growers of certified seed and considerable quantities will be available for distribution. As new adapted varieties of high quality and yield are found for Maryland they should be of great value both to the growers of certified seed in the mountain sections as well as to the early and late commercial potato growers of the shore and central sections of the State.

Fertilizer Studies with Early Potatoes and Sweet Potatoes. This work was started to determine the most satisfactory fertilizer and most suitable rotation for the production of early potatoes and sweet potatoes. Tests are being made to ascertain the influence of the following substances upon the productivity of potatoes: Lime in its relation to fertilizers and soil acidity, the most desirable phosphorus ratio for fertilizers, a comparison of concentrated fertilizer and ordinary fertilizer, new fertilizer materials, methods of application, ratios and the cost of production. This work was originally conducted at Snow Hill but last year it was moved to the Pilchard farm, Pocomoke City. So far, only one year's results are available.

Virus Disease in Potatoes. The work in the production in Maryland of seed potatoes free from virus diseases and of high producing quality has been and will be of great economic value to the State. The restoration of the most important of all fall potato varieties, the McCormick, to mosaic free condition is a worthy accomplishment alone. Garrett County potatoes can now be grown for satisfactory use as Eastern Shore seed, with successful methods worked out for keeping it virus free.

Potato Spraying and Dusting. The annual Potato Tour was held at the Pilchard Farm, Pocomoke, on June 17th. The results of early potato spraying were shown. On one plot sprayed with 4-4-50 Bordeaux plus 2 pounds calcium arsenate there was practically complete control of leafhoppers and potato fleabeetles, as well as the Colorado potato beetle. This plot, when dug, yielded an average of 166 bushels of primes and 63 bushels of culls, a total of 229 bushels per acre. Another plot was sprayed with calcium arsenate alone. This plot yielded only 142 bushels of primes and 59 bushels of culls, a total of 201 bushels per acre.

Additional spraying demonstrations for the control of diseases and insects were conducted on three farms in Garrett County.

MARYLAND SOILS

A State soil map and a supplementary report have been prepared and submitted to the Baltimore Association of Commerce for publication. The map shows the extent and location of the principal soil series of the State while the report includes the series description and their crop adaptation. Although each county has been surveyed, this is the first soil map of the State to be prepared. It is now possible to obtain a better conception of the extent, distribution and agricultural value of the soils of the State. It is believed that this map and report will be extremely valuable to the agricultural interests of the State and especially valuable for instructional purposes in the University.

As a result of the work done for the Baltimore Association of Commerce, a similar report will be issued by the Experiment Station. This report will be more detailed and include a scientific profile description of the principal soils, using modern nomenclature, together with their crop adaptation. This procedure will eliminate an enormous amount of repetition, produce a more useful publication, and be much more economical than county reports. See Bulletin No. 351.

Field Studies of the Fertility Requirements and Management of Important Soil Types. This work was started to determine the fertilizer and cropping system best adapted to several different soil types in Maryland, by maintaining similar series of plot tests and rotations on the different soil types of the State. The first field in operation was started in 1916. There have been twelve fields in this project, but at the present time there are only three. Originally the project called for single fertilizer ingredient treatments on the different soils to determine the most deficient fertilizer material. These tests have been modified from time to time. The fields in operation under this project are the ones at Ridgely, Princess Anne and LaPlata. The results can be summarized in the following manner: Barnyard manure has given the greatest returns of any fertilizer material. No combination or ratio of commercial fertilizers alone has equalled the returns from manure. Phosphorus has been by far the most deficient fertilizer ingredient. On some of the soils nitrogen was second to phosphorus, while on other soils potash had second place in the soil requirement. Superphosphate has been superior to the raw rock phosphate in all the tests as conducted on the outlying experimental plots. Manure when supplemented with superphosphate has given greater returns than manure alone.

Efficiency of Soil Fertility Management. To ascertain the extent to which soil fertility management determines the farm income by studying the adequacy of fertilizer recommendations the necessities of a fertility maintenance program and the economy of the usual fertility measures practiced on the leading soil series.

Thirty-three (33) farms have been located on several of the leading soil series of the State. The soils represented are types of the Hagerstown, Frankstown, Chester, Manor, Sassafras, Elkton and Keyport series. Maps of all the farms have been made which show the number and acreage of fields and the types of soils. The original or index samples of each farm have been taken and most of the chemical determinations made. The collection of the annual field samples was started in October, 1932, and the first set will be completed in November, 1933.

Availability of Phosphorus in Maryland Soils. This project was started in 1930 to ascertain the reason for the difference in response of Maryland soils to phosphate fertilizer. Some of these soils, although very low in total and soluble phosphorus, did not give increases for phosphate treatments. Lime applications sometimes gave increased crop response and on other soils caused a decrease in crop yield. At first the work was confined entirely to the soils which had received different amounts of phosphorus and lime treatment at the Ridgely substation. On the College Park Farm it has been found that heavy applications of lime materially increase the amount of the soluble phosphorus. Even light lime applications produced more soluble phosphorus on these soils. This is just the opposite of the results obtained upon the Ridgely soils. At this time the work has not progressed far enough to determine the cause of these differences.

HOGS

Hogs represent one of Maryland's important farm resources. They offer a medium for the profitable marketing of grain crops, particularly corn and soybeans. During the period of low prices for wheat, tests showed that much of it could be fed to hogs to financial advantage. This was particularly true with the lower grades of wheat. Many farms could also profit by substituting winter barley for wheat and feeding it to hogs.

Some recent experiments with the use of soybeans as a pasture for hogs showed that they were a valuable addition to the rations and produced larger and quicker gains than the hogs on dry lot feeding.

Mr. H. S. Hutton of Montgomery County cooperated with the Station in making a test of the use of whole and ground rye for pigs on pasture. There were 22 pigs in each lot. The following tabulation presents the results:

	Lot 1 Whole Rye Lbs.	Lot 2 Ground Rye Lbs.
Initial weight	2293.5	2294.5
Final weight	3770.5	3999.0
Total gain	1477.0	1704.5
Average daily gain per pig	1.2	1.38
Feed* consumed:		
Rye	6585.0	7770.5
Tankage	364.5	364.5
Minerals	29.0	26.0
Total	6978.5	8161.0
Feed* consumed per 100 lbs. gain:		
Rye	445.89	455.88
Tankage	24.68	21.38
Minerals	1.98	1.53
Total	472.48	478.79

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* Aside from poor second-crop clover pasture.

The results of this trial indicate that damaged rye, either whole or ground, fed to hogs on pasture can be used with a fair degree of success.

Litter Contests. During the past 8 years, 1925 to 1932 inclusive, Litter Contests requiring that a litter shall weigh at least 1,500 pounds at 150 days of age have been conducted within the State. From a study of data the following statements are indicated.

The fifty litters that were successful in reaching the required weight of 1,500 pounds or more contained a total of 529 pigs, having a combined weight of 92,259 pounds. Litter sizes ranged from 9 to 13 pigs. Ten per cent of all litters had 13 pigs per litter; 22 per cent had 12 or more pigs per litter; 40 per cent had 11 or more pigs per litter; 86 per cent, 10 or more pigs per litter; and 100 per cent, 9 or more pigs per litter.

Another item of success worthy of note is the fact that every one of the fifty litters reaching the goal required in the contest was sired by a purebred boar. It is evident, therefore, that a strong inherited capacity to produce pork rapidly and economically must be obtained by the use of purebred boars and proper breeding practices.

Hams. The study of factors influencing the quality of hams has developed that the process of curing and aging can be hastened and the quality improved by the use of a higher and controlled temperature than normally furnished.

SHEEP

The Improvement of the Market Value and Carcass Quality of Thin Native Lambs. About 800 to 1,200 "cull" and "medium" lambs are offered for sale at the Baltimore Union Stock Yards each week during the late summer and fall. Due to their poor finish, these lambs are unattractive to dealers and to consumers. Information regarding the suitability of these lambs for use as feeders and regarding the methods of treating for parasites, of feeding, and of management, should be of much value to farmers who contemplate marketing a portion of their feed through fattening lambs.

MUSKRAT

This is an important industry for the salt water marshes of the tide water areas.

The purpose of this investigation is to study the life history and habits of the muskrat, together with the possibilities of profitable pen-raising of these animals. Two and a half years have now elapsed since the establishment of the laboratory at Church Creek, Maryland.

Considerable progress has been made during the past year and many of the problems which at first caused trouble have been solved. By economy and better feeding methods the cost of feeding the animals has been reduced and it is hoped that this can still further be reduced in the future.

During the past year our pens have been increased to 40. Due to wet weather, it was found necessary to raise the nest boxes on six-inch frames filled with earth or sawdust. Little change has been made in feeding except that "Alpha Flakes" are now fed with the grain. The grain bins have been removed and the grain and flakes are now placed on a clean board in the pens. During the 1932 breeding season, 16 litters, totaling 47 young, were produced. This is an average of 2.9 young per litter. During the year 24 deaths occurred in the pens. Eight of these dead animals were examined to determine the cause of death.

Conditions on the marsh remain very favorable for muskrats. Most trappers reported a fairly good catch during the 1933 trapping season. This catch was not as high as before the 1930 drought. A study has been made of the food of the muskrat on the marsh. Twenty-one kinds of plants were found to be eaten as well as blue crabs, salt-water mussels, and three species of turtles. Marsh Hawks, Vultures, and Crows were found to feed upon the trapped animals. This loss can largely be prevented by tending the traps every day. Two species of mites were found on muskrats caught on the marsh. They were identified as *Tetragonyssus spiniger* and a new species of the genus *Listrophorus*. Several animals caught on the marsh were found to have abscesses and one had diseased kidneys.

TOBACCO

The Supply and Distribution of Maryland Tobacco. From July to October, 1932, three hundred field records on the cost of producing tobacco in 1931 were obtained. These records were apportioned between the five counties of Southern Maryland on the basis of the number of tobacco growers in each county.

The records on the cost of producing tobacco in 1931 and in 1928 have been tabulated and part of the statistical analysis has been completed. When the field records on the cost of producing tobacco were taken, all the tobacco was not sold. To obtain complete sales for the 300 growers who were included in the survey, it was necessary to copy the record of their sales from the books of the selling agents in Baltimore. In January, 1933, the record of sales of those growers, included in the survey, who shipped to the Maryland Tobacco Growers' Association, were tabulated.

The tobacco marketed and the prices received by the various selling agencies in Baltimore City have been obtained for the period 1920 to 1932. This information has been tabulated and analyzed.

Data showing the variation of the prices offered by various buyers on the Baltimore market for the same lot of tobacco have been obtained and partly analyzed. Also data have been obtained showing the variation in prices for which hogsheads of the same grade of tobacco were sold. Part of this information was summarized, analyzed, and made available to those people interested in having enacted a grading law at the last session of the Legislature.

The amount of Maryland tobacco exported to various countries and the average price received have been obtained from records of the Department of Commerce for the period 1923 to 1932.

The fertility studies have developed marked characters indicating potash deficiency and that insufficient magnesium will cause the trouble known as "sand drown." Some progress has been made in showing that the prevalence of some disease conditions are associated with the kind and sources of plant food. Tests of Bordeaux spray for downy mildew of tobacco beds proved of some advantage but did not control the trouble.

LIST OF ACTIVE PROJECTS, 1933-34

Agricultural Economics:
A-15. The Supply and Distribution of Maryland Tobacco.
A-18. Organization and Management of Maryland Farms.
A-18-a. Insurance and Credit Problems of Maryland Farmers.
A-18-c. Farming on Small Acreages in Maryland.
A-18-d. The Dairy and Milk Situation in Maryland Compared with Other Markets.
A-19. The Farm Tax Problem in Maryland.
A-23. Consumer Preference and Market Demand for Eggs in Washington, D. C.

Agronomy—Crops:
B-38. Corn.
B-39. Wheat.
B-41. Barley.
B-42. Hay, Forage and Pasture.
B-43. Annual Legumes.
B-44. Sugar Corn.
B-45. Miscellaneous Projects (Crop Rotation).
B-47. Studies on the Reproductive Capacity of the su (sugar) Factor in Relation to the Su (Starch) Factor in Corn.
B-48. The Effective Sex-Ratio in Corn and Its Relation to Yield.

Agronomy—Soils:
O-25. Effect of Organic Matter on the Fertility of Leonardtown Loam.
O-26. Soil Survey and Management of Maryland Soils.
O-27. Field Studies of the Fertility Requirements and Management of Important Soil Types.
O-28. Fertilizer Studies with Early Potatoes and Sweet Potatoes.
O-31. Soil Fertility Studies in Relation to Tobacco Brown Root Rot.
O-33. Efficiency of Soil Fertility Management.
O-34. Field Study of Fertility Requirements of the Tobacco Crop on Sassafras Soil at Cheltenham.
O-36. Availability of Phosphorus in Maryland Soils.
O-37. Fixation of Phosphorus in Maryland Soils.
O-41. Eradication of Crabgrass.
O-42. Effects of Fertilizer on Fertility and Grass Population of Pastures.

Animal Husbandry:
C- 6. Study of Quality in Maryland Hams.
C-10. The Improvement of the Market Value and Carcass Quality of Thin Native Lambs.
C-12. A Comparison of Fishmeal and Cottonseed Meal as a Protein Supplement for Breeding Ewes and Their Fattening Lambs.
C-13. The Breeding of Flock Ewes Suitable for Early Lamb Production.
C-14. Fishmeal vs. Linseed Meal for Fattening Young Steers.
C-15. Intensive Breeding of Swine.

Biological Laboratory:
D-28. A Study of the Methods of Transmission of the Causative Agent of Black-head in Turkeys.
D-31. Bang's Disease: A Study of the Economics of Clean and Infected Herds.
D-34. Bang's Disease: To Attempt to Isolate Brucella Abortus from the Urine and Feces of Cattle.
D-35. Bang's Disease: To Determine the Percentages of Mastitis in Negative, Suspicious and Positive Animals.

Dairy Husbandry:
G- 3. Control of Contagious Abortion in the Experiment Station Dairy Herd.
G-10. A Study in the Production of Naturally and Mechanically Produced Soft Curd Milk.
G-11. Growth Data on Dairy Animals from Birth to Freshening Age.
G-12. Efficiency of Dairy Herd Management.

Entomology:

H-21. Biology and Control of Some Greenhouse Pests.
H-22. Repelling Stable Flies.
H-23. A Study of Laspeyresia Molesta Busck in Maryland (Oriental Peach Moth).
H-24. Winter Protection of Bees.
H-25. Biology and Control of the Peach Tree Borer.
H-26. Dusting Peach and Apple Trees for the Control of Insects and Diseases.
H-27. Insecticide Investigations: Sub-title: The Chemical, Physical and Insecticidal Properties of Pine Tar Creosotes and Some Allied Products, etc.
H-28. Methods for the Control of the Potato Tuber Moth.
H-29. Corn Earworm—Life History and Control.
H-30. Apple Insects—Apple Plant Lice.
H-34. Study of Insecticidal Properties of Pyrothum and Its Products.
H-35. Nursery Insects.
H-36. Insecticide Investigations.

Floriculture:

I-17. A Study of Calyx Splitting in Carnations.
I-18. Effect of Soil Types on Yields of Greenhouse Crops, Carnations.
I-19. Breeding and Selection of Snapdragons.
I-20. Effect of Time of Ripening of Bulb on Forcing Qualities of Gladiolus.
I-21. Treatment of Greenhouse Soil in Solid Beds.
I-22. Greenhouse Crop Fertilizers.
I-23. Dahlia Variety Testing.

Home Economics:

R- 3. Making Home and Family Adjustments to Present Day Needs.
R- 4. Testing Soft Winter Wheat Flours for Cake and Biscuits.
R- 5. Methods of Cooking as a Factor in Palatability of Hams.

Plant Pathology:

J-44. Annual Plant Disease Survey.
J-45. Botanical Survey of Maryland.
J-46. Identification of Plants.
J-48. Carnation Diseases.
J-49. Fruit Rot Sclerotinia.
J-50. Varieties Resistant to Disease.
J-69. Tobacco Disease.
J-71. Apple Scab.
J-72. Potato Seed Control.

Plant Physiology:

K- 7. Physiological and Biochemical Aspects of Vegetable Storage.
K-16. Symptoms of Mineral Nutrient Deficiencies in Plants with Special Reference to Tomatoes.
K-17. A Physiological Study of the Resistance and Susceptibility of Tomato Plants to Fusarium Wilt.
K-18. A Physico-Chemical Study of the Soluble Polysaccharides in Sweet Corn.
K-19. A Study of the Relative Importance of External Factors on the Ratio of Bound and Free Water in Plant Tissues.

Plant Propagation:

E- 1. Plant Propagation with Special Reference to Cuttings.

Pomology:

L-40. The Breeding of Blight Resistant Pears.
L-45. Fruit Spur and Biennial Bearing Studies of Apples.
L-46. The Effect of Shade on Horticultural Plants, Fruits, Vegetables, Flowers.
L-47. The Effect of Varying the Length of Day on Plant Growth and Chemical Composition.
L-48. The Fertilization of Apple Orchards.
L-49. The Fertilization of Peach Orchards.
L-50. Sod Versus Tillage for Apple Orchards.
L-51. The Propagation of Apple Trees on Their Own Roots.
L-52. The Fertilization of Strawberries.
L-53. The Effect of Bud and Spur Defoliation on Fruit Bud Formation.
L-54. The Influence of Pollination on Fruit Yields.
L-55. Experiments in Grape Training and Pruning.
L-56. The Rejuvenation of Peach Orchards.
L-57. Peach Pruning Experiments.
L-58. The Breeding of Early Colored Grapes.
L-59. Variety Tests of Apples, Peaches, Pears, Plums, and Cherries.
L-60. Variety Tests of Grapes and Strawberries.
L-61. Variety Tests of Bush Fruits.
L-62. Transplanting Studies with Trees.
L-63. Collection of Phenological Data.
L-64. Apple Breeding and Testing of New Seedlings.
L-65. An Economic Study of Peach Cling Varieties for Canning.
L-66. An Economic Study of Peach Planting Distances.

Pomology:—(Continued)

L-67. A Study of Factors Influencing the Red Color in Apples.
L-68. A Study of the Effect of Nitrogen and Other Fertilizers on the Firmness of Flesh, Shipping Quality and Keeping Quality of Various Fruits.
L-69. Studies of the Effect of Different Nitrogenous Fertilizers on Orchard Fruits.
L-70. A Study of the Effect of Potash on Coloring, Maturity, Shipping and Keeping Qualities of the Fruits of Strawberries, Peaches, and Apples.

Poultry:

M-28. Egg Laying Competition. A Study of Six Years' Data.
M-29. Tests of Special Methods for Drying and Pulverizing Poultry Manure as It Comes from the Droppings Boards.
M-30. A Controlled Test to Determine the Efficiency of Approved Good Management in the Control of Bacillary White Diarrhea.

Ridgely Farm:

S- 1. Growing Multiplication Plots of Mammoth Red Wheat for Distribution.
S- 2. The Use of Fertilizers in the Rotation of Corn, Wheat, Hay and Tomatoes.
S- 3. Tests with Late Potatoes, New Varieties and Seedlings.
S- 4. Variety and Fertilizers Tests of Strawberries.
S- 5. Experiments with Sweet Potatoes, Cantaloupes, Multiplication of Types.
S- 6. Experiments with Garden Peas for Canning.
S- 7. Tests of Varieties of Tomatoes and Early Plants on Total Yield.
S- 8. The Effect of Lime With and Without Fertilizers and Manure.
S- 9. Tests of Different Kinds of Lime on Alfalfa.
S-10. Variety Tests of Corn, Wheat and Soybeans.
S-11. Tests of New Selections of Wheat.

Seed Inspection:

N- 7. Inspection of Seeds Sold Throughout the State Each Year.
N- 8. Examination of Samples Taken from Seeds Sold Throughout the State Each Year.
N- 9. Examination of Samples Submitted to the Laboratory Each Year.
N-10. Identification of Seeds Submitted to the Laboratory from Time to Time.
N-11. Studies of Observed Variations Among Germination Tests.
N-12. Studies of Changes in Weight of Various Components of Seed Samples and the Resulting Effects on the Percentage Compositions.

Tobacco Investigations:

P- 1. Tobacco Breeding and Variety Tests.
P- 2. Crop Rotation Tests with Tobacco.
P- 3. Effects of Crops on Yields of Succeeding Crops in the Rotation with Special Reference to Tobacco.
P- 4. Fertilizer Tests and Studies in the Nutrition Requirements of the Tobacco Plant, with Reference to Both Quality and Yield of Leaf Tobacco.
P- 5. Improved Methods of Handling Seed Beds, Including Steam Sterilization.
P- 6. Nutritional Deficiency Studies.

Vegetable Gardening:

Q-56. Potatoes:
    A. Improvement of McCormick and Other Varieties by Tuber Unit Selection.
    B. Variety Improvement with Special Relation to a Good Late Variety.
    C. Raising New Varieties from Seeds.
Q-58. Peas—Factors Influencing Yield and Quality of Canning Peas.
Q-59. Rhubarb—Chemical Fertilizers with Special Reference to Sulfate of Ammonia.
Q-60. Cantaloupes—Breeding and Selection.
Q-61. Sweet Potatoes—Best Size Roots for Plant Production and the Effect on Yields.
Q-62. General Fertility Problems: Maintaining the Fertility of Land for Garden Crops.
Q-63. Testing New Varieties and Strains of Vegetables.
Q-65. Planting Distances and Different Formulas of Fertilizers for Vegetables.
Q-66. The Selection of a Strain or Strains of Spinach That Will Meet the Market and Canners' Requirements.

Q-67. Tomatoes:
    A. Breeding and Selection of Varieties for Canning.
    B. The Influence of Green Manures Supplemented by Commercial Fertilizers on Tomatoes.
    C. Economic Value of Certain Cultural Conditions on the Yield and Quality of Raw and Manufactured Tomato Stock.
    D. Effect of "Rested" Land Versus Cultivation and Green Crops on Production.
Q-68. A. Yielding Capacity and Qualities of Different Varieties of Beans.
    B. Yield Capacity and Qualities of Different Varieties of Beets.
Q-70. An Economic Study of Grade, Maturity, Composition, and Canning Quality of Corn as Influenced by Seasonal and Cultural Conditions.
Q-71. Potato Breeding and Inheritance.
Q-72. A Study of the Factors Affecting the Development of Red Color of Canned and Raw Stock Tomatoes and of Market Garden Tomatoes.
Q-73. An Economic Study of Canning Crops in Rotation with Special Reference to Physiology and Pathology of Canning Peas.

FINANCIAL RESOURCES AND EXPENDITURES

The Experiment Station is maintained by Federal and State appropriations, by sales of farm products and small contributions from time to time for special pieces of research.

The Federal acts outline the functions and lines of work to be undertaken. The State appropriations are for the most part for general and executive expenses and supplementary to the Federal Acts.

The Biological Laboratory and Seed Inspection funds are used largely for regulatory work and can not be strictly classed as research funds.

The following table gives the details as to the appropriations and expenditures:

MARYLAND AGRICULTURAL EXPERIMENT STATION
IN ACCOUNT WITH
UNITED STATES APPROPRIATION

	Hatch Fund	Adams Fund	Purnell Fund
Dr.			
To Appropriations for Fiscal Year, 1932-1933	$15,000.00	$15,000.00	$60,000.00
Cr.			
By Salaries	$13,645.01	$14,956.61	$50,942.85
Labor	1,335.00		2,701.05
Stationery and Office Supplies			103.99
Scientific Supplies			720.18
Sundry Supplies			185.77
Fertilizers			314.04
Communication Service	19.99	.09	84.84
Travel		43.30	2,559.46
Transportation of Things			44.48
Publications			1,307.28
Heat, Light, Water and Power			44.36
Furniture, Furnishing and Fixtures			40.59
Library			11.82
Scientific Equipment			886.84
Livestock			35.00
Tools, Machinery and Appliances			17.45
Totals	$15,000.00	$15,000.00	$60,000.00

MARYLAND AGRICULTURAL EXPERIMENT STATION IN ACCOUNT WITH THE STATE APPROPRIATIONS

	General Fund	Ridgely Farm
Dr.		
Balance June 30, 1932	....	....
Receipts for year 1932-1933	$81,560.01	$4,689.82
	$81,560.01	$4,689.82
Cr.		
By Salaries	$29,409.80	$1,980.00
Labor	15,402.55	1,878.60
Stationery and Office Supplies	133.33	....
Scientific Supplies	1,670.45	....
Feeding Stuffs	6,945.40	20.38
Sundry Supplies	2,347.28	178.18
Fertilizer	1,304.94	164.48
Communication Service	881.55	29.30
Travel Expenses	1,009.49	35.05
Transportation of Things	1,656.66	5.80
Publications	912.93	....
Heat, Light, Water and Power	1,736.41	2.52
Furniture, Furnishings and Fixtures	996.38	....
Library	505.19	....
Scientific Equipment	2,246.26	....
Livestock	1,032.96	....
Tools, Machinery and Appliances	4,101.68	70.14
Buildings and Land	2,090.21	....
Contingent	1,310.31	....
Total	$75,693.78	$4,364.45
Overdraft June 30, 1932	5,866.23	251.28
	$81,560.01	$4,615.73
Credit Balance June 30, 1933	....	74.09
	$81,560.01	$4,689.82

MARYLAND AGRICULTURAL EXPERIMENT STATION IN ACCOUNT WITH THE STATION FARM FUND

Dr.	
Receipts 1932-1933	$17,525.57
Total	$17,525.57
Cr.	
By Salaries	$ 1,188.31
Labor	10,238.63
Stationery and Office Supplies	4.20
Scientific Supplies	79.49
Feeding Stuffs	267.30
Sundry Supplies	159.98
Fertilizer	36.00
Travel Expense	674.75
Transportation of Things	185.28
Publications	662.33
Heat, Light, Water and Power	69.32
Furniture, Furnishings and Fixtures	....
Library	23.00
Scientific Equipment	108.90
Livestock	60.00
Tools, Machinery and Appliances	134.43
Muskrat Investigation	200.93
Contingent	211.02
Total	$14,303.87
Overdraft June 30, 1932	1,318.12
	$15,621.99
Credit Balance June 30, 1933	1,903.58
	$17,525.57

MARYLAND AGRICULTURAL EXPERIMENT STATION
IN ACCOUNT WITH
REGULATORY AND PUBLIC SERVICE FUNDS

	Biological Laboratory	Seed Inspection
Dr.		
Balance June 30, 1932	$ 2,615.16	
Receipts for Year 1932-1933	15,090.52	$10,705.88
Totals	$17,705.68	$10,705.88
Cr.		
By Salaries	$ 8,191.67	$ 8,960.00
Labor	1,893.92	164.63
Stationery and Office Supplies	133.53	38.00
Scientific Supplies	886.20	54.72
Feeding Stuffs	794.44	
Sundry Supplies	1,250.60	174.60
Fertilizer		
Communication Service	442.77	134.99
Travel Expense		204.06
Transportation of Things	349.39	
Publications		78.95
Heat, Light, Water and Power	1,037.62	13.12
Furniture, Furnishings and Fixtures	529.20	
Scientific Equipment	1,021.24	9.10
Livestock	57.00	
Tools, Machinery and Appliances	95.85	92.00
Buildings and Land		16.95
Contingent	74.50	4.50
Total	$16,757.93	$ 9,945.62
Overdraft June 30, 1932		760.26
	$16,757.93	$10,705.88
Credit Balance	947.75	
	$17,705.68	$10,705.88